IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

AKOUSTIS TECHNOLOGIES, INC., and AKOUSTIS, INC.,	§	
	§	
Plaintiffs,	§	
	§	
v.	§	NO. 2:23-CV-00180-JRG-RSP
	§	
QORVO, INC.,	§	
	§	
Defendant.	§	

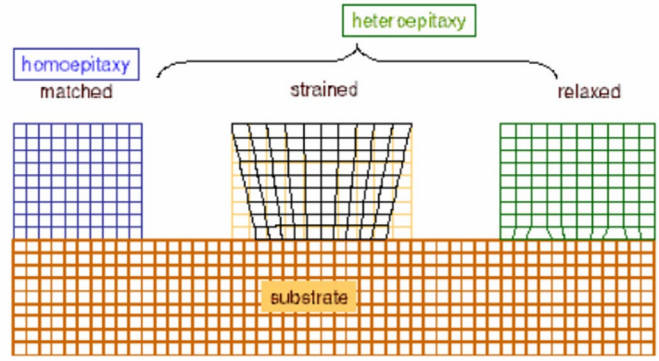
CLAIM CONSTRUCTION ORDER

Akoustis Technologies, Inc., and Akoustis, Inc., (together, "Akoustis") allege infringement by Qorvo, Inc., of claims from U.S. Patent 7,250,360. The patent relates to making integrated circuits and, more specifically, a "process for nucleation and subsequent epitaxial growth on a lattice mismatched substrate." *See* '360 Patent at 1:17–18.

The parties dispute the scope of five terms from Claim 1. For each term, Akoustis argues the term does not require construction. Qorvo, however, proffers a specific construction for four of the terms, and challenges the fifth as indefinite. Having considered the parties' briefing and arguments during a July 24, 2024 hearing, the Court resolves the disputes as follows.

I. BACKGROUND

Generally, integrated circuits are formed by depositing or growing a number of material layers on a semiconductor substrate. *See* Bravman Decl., Dkt. No. 102-5 ¶ 7. "Epitaxy is a particular type of layer deposition where a crystalline layer is formed on another crystalline layer such that it has a well-defined orientation to the underlying layer . . . ." *Id.* ¶ 10.



A diagram provided by Akoustis's expert illustrating the difference between homoepitaxy and heteroepitaxy. Bravman Decl., Dkt. No. 102-5 ¶ 11

The patent concerns "heteroepitaxy," which is the process of growing an epitaxial layer on an underlying layer that has a different lattice structure. Bravman Decl., Dkt. No. 102-5 ¶ 11. "In a heteroepitaxial process, there must be an area of transition between the mismatched lattice structures . . . ." *Id.* As the patent explains:

> Heteroepitaxial growth of GaN and related alloys on severely mismatched substrates . . . thin nucleation layers to provide nucleation sites to initiate crystal growth. When optimized, these nucleation layers accommodate the strain between the substrate and epitaxial layers caused by lattice and thermal mismatches, while still maintaining crystallographic registration of the epitaxial films to the substrate lattice structure. The most commonly accepted practice for nucleation[1] of these substrates with GaN-based material utilizes a two-temperature process involving either one or two flow paths. In addition, different growth pressures are used on certain steps in the nucleation process. In this fashion, high structural and electrical quality epitaxial films can be realized in severely mismatched material systems.

[1] "Nucleation" refers to the process of depositing the initial layer on the substrate. *See* U.S. Published Appl'n 2002/0090816 (Ashby) (referring to "growth of a thin nucleation layer of sufficient thickness to permit subsequent growth of a coalesced single-crystal or nearly single-crystal layer on top of the nucleation layer"). Qorvo relied on Ashby in its Petition for *Inter Partes* Review. *See* Dkt. No. 107-3 at 5.

'360 Patent at 1:21–35.

The patent teaches a "single step process for the nucleation and subsequent epitaxial growth on a lattice mismatched substrate." '360 Patent at 1:21–35; *see also id.* at 2:3–4 ("The present single step process is a single flow, single pressure, high temperature process."). The process "eliminates the large temperature ramps and complex flow requirements of the commonly used two-step nucleation technologies." *Id.* at 2:7–9.

Claim 1, which includes each of the disputed terms, recites:

> 1. A process for growing an epitaxial layer on a **lattice mismatched substrate** comprising the steps of:
>
> a) providing a **substrate**;
>
> b) pre-treating a surface of the substrate with at least one group III reactant or at least one group II reactant **at an elevated growth temperature prior to introducing a group V reactant or a group VI reactant**;
>
> c) introducing a group V reactant or a group VI reactant to grow a **nucleation layer** on the surface of the substrate; and
>
> d) growing a buffer layer on said nucleation layer, said buffer layer providing a surface upon which said epitaxial layer is grown.

'360 Patent at 5:2–14 (disputed terms bolded). In the Detailed Description of the Invention, the patent sets forth the various reactants composing each group. *See id.* at 2:36–67.

II. LEGAL STANDARDS

A. Generally

"[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). As such, if the parties dispute the scope of the claims, the court must determine their meaning. *See, e.g.*, *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1317 (Fed. Cir. 2007) (Gajarsa, J.,

concurring in part); *see also Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 390 (1996), *aff'g*, 52 F.3d 967, 976 (Fed. Cir. 1995) (en banc).

Claim construction, however, "is not an obligatory exercise in redundancy." *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997). Rather, "[c]laim construction is a matter of [resolving] disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims . . . ." *Id.* A court need not "repeat or restate every claim term in order to comply with the ruling that claim construction is for the court." *Id.*

When construing claims, "[t]here is a heavy presumption that claim terms are to be given their ordinary and customary meaning." *Aventis Pharm. Inc. v. Amino Chems. Ltd.*, 715 F.3d 1363, 1373 (Fed. Cir. 2013) (citing *Phillips*, 415 F.3d at 1312–13). Courts must therefore "look to the words of the claims themselves . . . to define the scope of the patented invention." *Id.* (citations omitted). The "ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1313. This "person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id.*

Intrinsic evidence is the primary resource for claim construction. *See Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1348 (Fed. Cir. 2010) (citing *Phillips*, 415 F.3d at 1312). For certain claim terms, "the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." *Phillips*, 415 F.3d at 1314; *see also Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed.

Cir. 2005) ("We cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history."). But for claim terms with less-apparent meanings, courts consider "those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean . . . [including] the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art." *Phillips*, 415 F.3d at 1314.

B. Indefiniteness

"[A] patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc*., 572 U.S. 898, 901 (2014). The claims "must be precise enough to afford clear notice of what is claimed" while recognizing that "some modicum of uncertainty" is inherent due to the limitations of language. *Id.* at 908. "Indefiniteness must be proven by clear and convincing evidence." *Sonix Tech. Co. v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017).

III. THE LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is the skill level of a hypothetical person who is presumed to have known the relevant art at the time of the invention. *In re GPAC*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In resolving the appropriate level of ordinary skill, courts consider the types of and solutions to problems encountered in the art, the speed of innovation, the sophistication of the technology, and the education of workers active in the field. *Id.* Importantly, "[a] person of ordinary skill in the art is also a person of ordinary creativity, not an automaton." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

Here, the parties offer similar levels of ordinary skill in the art for analyzing the disputed terms. Akoustis asserts a skilled artisan would have had "a bachelor's degree in electrical engineering, materials science, chemical engineering, or an equivalent field, as well as least 3 years of academic or industry experience in nucleation and epitaxial growth processes, or other comparable industry experience." Dkt. No. 102 at 5 (quoting Giapis Decl., Dkt. No. 102-4 ¶ 16). According to Qorvo, a skilled artisan "would have had at least a bachelor's degree, or the equivalent degree, in materials science, physics, electrical engineering or a related field, and 3–5 years of experience in the research, design, or development of semiconductor devices, or equivalent experience." Dkt. No. 107 at 9–10 (citing Bravman Decl., Dkt. No. 102-5 ¶¶24–25). Qorvo calls these "slightly different descriptions," and asserts any differences between them are immaterial to resolving the present disputes. *Id.* at 10 n.4. The Court agrees with that assessment and notes neither party suggests the proper resolution of the disputes turns on resolving the differences between the parties' proposed levels of skill.

IV. THE DISPUTED TERMS

A. "lattice mismatched substrate" (Claim 1); "[a/the/said] substrate" (Claims 1, 2, 6, 10)

Akoustis's Construction	Qorvo's Construction
Plain and ordinary meaning, e.g., not indefinite and no further construction necessary.	**"lattice mismatched substrate":** "a crystalline substrate with a lattice constant that differs from the epitaxial layer" **"[a/the/said] substrate":** "the lattice mismatched substrate"

Claim 1's preamble recites "[a] process for growing an epitaxial layer on a lattice mismatched substrate." '360 Patent at 5:2–3. The parties agree the preamble is limiting, Joint Cl. Constr. & Prehr'g Statement, Dkt. No. 81 at 1, and "lattice mismatched substrate" doesn't appear in the body of the claim. Qorvo offers a construction for "lattice mismatched substrate," and then

suggests all references to "substrate" in the body refer to the "lattice mismatched substrate" of the preamble. Dkt. No. 107 at 14–15.

Akoustis, however, urges the Court to reject Qorvo's constructions as unnecessary. Regarding the word "crystalline" in Qorvo's construction, Akoustis calls that "redundant because epitaxy implies that the substrate must be crystalline." Dkt. No. 102 at 6 (quoting Giapis Decl, Dkt. No. 102-4 ¶ 58). Moreover, it says Qorvo's construction "introduces further ambiguity by reference to 'lattice mismatched substrate' from the preamble, which is unnecessary given the context that 'substrate' appears in the claim." *Id.* at 7.

The Court sees little daylight between the parties' positions, at least for "lattice mismatched substrate" in the preamble. For example, they agree the substrate must be "crystalline" and that the "mismatch" refers to "the substrate and epitaxial layer having difference lattice parameters." *Id.* at 6. Akoustis's expert explains those parameters are "the distances between unit cells in a crystal." Giapis Decl., Dkt. No. 102-4 ¶ 54. The patent itself characterizes "the substrate" as "a mismatched substrate comprising a material that is lattice mismatched to an epitaxial layer to be grown thereon." *Id.* at 2:30–33.

Regarding whether "substrate" in the body should relate back to "lattice mismatched substrate" in the preamble, Akoustis makes three arguments in opposition. First, it says the term is readily understandable, so no construction is necessary. Dkt. No. 102 at 6–7. Second, Qorvo's construction would incorrectly narrow the claims by requiring each recited substrate to be the same "latticed mismatched substrate" from the preamble. Dkt. No. 108 at 3. More specifically, "Qorvo's construction would improperly narrow the claims to embodiments starting with a single substrate and ending with a single lattice mismatched substrate." *Id.* Finally, "it is technically impossible for the claimed substrate to be lattice mismatched at the first step of the claimed process." *Id.* at 4.

Rather, says Akoustis, the mismatch arises when the epitaxial layer is later grown on the substrate recited in the first step. *Id.*

None of these arguments are persuasive. For one, the Court disagrees with what Akoustis says would be the effect of Qorvo's construction. Akoustis cites the rule that "'a' means 'one or more,'" Dkt. No. 108 at 3, but even applying that rule, the Court does not see how tying the "one or more substrates" of the first step to the "one or more lattice mismatched substrates" of the preamble narrows the claim in the way Akoustis suggests. As for Akoustis's other argument—that the substrate does not become "lattice mismatched" until performing the steps of Claim 1—the specification uses the term "lattice mismatched substrate" differently, as Akoustis recognizes. *See id.* at 4 (citing '360 Patent at 2:30–32 ("The substrate is a mismatched substrate comprising a material that is lattice mismatched to an epitaxial layer *to be grown [in the future] thereon*." (emphasis added))). In fact, the specification describes the mismatched substrate as simply "silicon, sapphire, or SiC," without any reference to a then-existing epitaxial layer. '360 Patent at 2:32–33.

At the hearing, the Court considered a construction for "lattice mismatched substrate" of "a crystalline substrate comprising a material that has a lattice with a distance between its unit cells that is different from the distance between unit cells of the epitaxial layer to be grown thereon," to which the parties agreed. The Court now adopts that construction, and also concludes each reference to "substrate" in the claims refers to the "lattice mismatched substrate" of the preamble.

B. "at an elevated growth temperature" (Claim 1)

Akoustis's Construction	Qorvo's Construction
Plain and ordinary meaning, e.g., not indefinite and no further construction necessary.	Indefinite.

The second step of Claim 1 recites "pre-treating a surface of the substrate with at least one

[reactant] *at an elevated growth temperature*." '360 Patent at 5:5–7 (emphasis added). Qorvo challenges this phrase as an unbounded term of degree, noting neither Akoustis nor its expert identify any objective standards for determining the scope of "elevated growth temperature." Dkt. No. 107 at 18. Qorvo also accuses Akoustis of now arguing, for the first time, that "elevated growth temperature" is "a temperature elevated from the temperature required for growth." *Id.* (citing Dkt. No. 102 at 10).

Disputing that this is a term of degree, Akoustis argues a skilled artisan would understand this term to mean "a temperature sufficient for depositing a desired element or compound using the chosen gaseous reactant(s)." Dkt. No. 102 at 9 (citing Giapis Decl., Dkt. No. 102-4 ¶ 89); *see also* Dkt. No. 108 at 4 (claiming "Quorvo mislabels *elevated growth temperature* as a 'term of degree'"). Akoustis notes Qorvo had no problems understanding this term during related IPR proceedings, and also understood this term in its invalidity contentions. *Id.* at 10–11. It concludes, from the results of Google Scholar and Google Patents searches, the term is a commonly used phrase in journals, so the term must have a meaning in the art. Dkt. No. 102 at 11–12.

The term itself begs the question, "elevated" relative to *what*? To the temperatures used in the prior-art process? Or, as Akoustis suggests, relative to the minimum growth temperature? Or does the term just mean a "high" temperature? *See* '360 Patent at 2:3–4 ("The present single step process is a single flow, single pressure, *high-temperature* process."). And if so, what is a "high temperature"?

To start, Akoustis's position is inconsistent with the patent's distinction over the prior art two-temperature process. If the prior art uses a two-temperature process, at least one of those temperatures would be an "elevated growth temperature" under Akoustis's construction. In other words, they could not both be a "minimum growth temperature." Moreover, the patent seems to

equate "elevated growth temperature" with "high temperature." *See* '360 Patent at 2:3–4 ("The present single step process is a single flow, single pressure, *high-temperature* process."). Together, this suggests "elevated growth temperature" is not merely "elevated" relative to the minimum growth temperature for a compound.

Dr. Giapis's declaration does not compel a contrary conclusion. He notes that "facilitating growth at an increased rate is generally desired," and then concludes that somehow defines the term "elevated growth temperature" as anything other than the minimum growth temperature. Dkt. No. 108 at 5. He does not, however, provide evidence the disputed phrase is a term of art that a skilled artisan would understand as "any temperature above a minimum growth temperature."

That said, the term is not indefinite, because a skilled artisan reading the patent would understand "elevated growth temperature" as any temperature from 900 to 1100 °C. Under a heading of "Detailed Description *of the Invention*," the patent provides a summary-like description of what it calls the "present invention," followed by two examples. In the first paragraph of that summary-like description, the patent states "[i]n a preferred embodiment, the elevated growth temperature is 900 to 1100 °C." '360 patent at 2:50–51. In the second paragraph, the patent again explains the substrate is "subjected to the *desired elevated growth temperature*, preferably 900 to 1100 °C." *Id.* at 3:13–15. (emphasis added). This is the only range of temperatures identified by the patent for "elevated growth temperature."

The Detailed Description then transitions to describing specific embodiments, Example 1 and Example 2. In Example 1, the elevated growth temperate is 1040 °C. '360 Patent at 3:63–64 ("After 10 minutes, the temperature is decreased to the growth temperature of 1040 °C."). In Example 2, the growth temperature is 1016 °C. *Id.* at 4:31–32 ("RF power is decreased to stabilize the substrate at the growth temperature of about 1016 °C.").

Based on the Detailed Description of the Invention, and specifically the difference in how that section describes the present invention relative to the disclosed embodiments, a skilled artisan would understand "elevated growth temperature" to be a temperature within the range of 900 to 1100 °C. Despite the use of "preferably," the first two paragraphs describe the invention as a whole, with specific embodiments provided by the two examples. Accordingly, the Court construes "at an elevated growth temperature" as "at a growth temperature of 900 to 1100 °C."

C. "prior to introducing a group V reactant or a group VI reactant" (Claim 1)

Akoustis's Construction	Qorvo's Construction
Plain and ordinary meaning, e.g., not indefinite and no further construction necessary.	"prior to introducing any group V or group VI reactant" - OR – "prior to introducing the group V or group VI reactant in step c) * * * If not construed in this manner, indefinite pursuant to 35 U.S.C. § 112 ¶ 2.

Qorvo wants to "clarify" this phrase from Claim 1 so Akoustis does not "later argue to the jury that the claims allow introduction of a group V or group VI reactant before the pretreatment step." Dkt. No. 107 at 23. Akoustis replies that Qorvo's constructions would either impermissibly expand or narrow claim scope. Dkt. No. 108 at 8.

The Court agrees with Qorvo. Specifically, a skilled artisan would understand from both the claim language and the specification that the phrase operates to restrict the introduction of *any* group V or group VI reactant before or during the "pre-treatment" step. In step c), the claim uses the article "a" rather than "the" before both "group V reactant" and "group VI reactant," which suggests step c) is not referencing specific reactants from step b). And as the Detailed Description

explains, "*[o]nce the pre-treatment is complete*, the group V reactant or the group VI reactant is introduced to begin growth of the nucleation layer." '360 Patent at 2:56–58 (emphasis added). Logically, introduction of a group V reactant or the group VI reactant before or during the "pre-treatment" step would start formation of the nucleation layer, even if it were a different group V or group VI reactant than introduced in step c). That contradicts the specification's teachings.

Akoustis's only meaningful objection to this interpretation is that "any" could somehow mean "none." Akoustis analogizes to the parties' obligations under Fed. R. Civ. 7.1(a)(1)(A), which requires disclosure of "any parent corporation," and notes Qorvo's disclosure that "it has no parent corporation." Dkt. No. 108 at 8. That, however, is clearly a different context for the use of "any" that doesn't apply here. The Court therefore rejects Akoustis's position that construing this phrase as urged by Qorvo "expand[s] Plaintiff's claims to include the possibility of no group V or group VI reactant," *id.*, and construes the phrase to mean "prior to introducing any group V or group VI reactant." Thus, for the claim to read on a particular accused process, the "pre-treating" step of the process must occur before the introduction of any group V or group VI reactant—not just the group V or group VI reactant introduced in step c).

D. "nucleation layer" (Claims 1, 7, 12)

Akoustis's Construction	Qorvo' Construction
Plain and ordinary meaning, e.g., not indefinite and no further construction necessary.	"a layer between the buffer layer and pre-treated substrate made from the reactants chosen in steps b) and c)"

The parties appear to mostly agree on the scope of this term. Akoustis notes the parties' agreement that the order of claimed steps is limiting, and suggests a jury can understand (1) the nucleation layer is between the buffer layer and pretreated substrate, and (2) the nucleation layer is made from the reactants chosen in steps b) and c). Dkt. No. 108 at 9–10. Thus, reasons Akoustis,

no construction is necessary.

At the hearing, the Court tentatively construed this term as "a layer formed between the buffer layer and the pretreated substrate." Neither party objected to that preliminary construction, which the Court now adopts.

V. CONCLUSION

Disputed Term	The Court's Construction
"lattice mismatched substrate" (Claim 1)	"a crystalline substrate comprising a material that has a lattice with a distance between its unit cells that is different from the distance between unit cells of the epitaxial layer to be grown thereon"
"[a/the/said] substrate" (Claims 1, 2, 6, 10)	"the lattice mismatched substrate"
"nucleation layer" (Claims 1, 7, 12)	"a layer formed between the buffer layer and pretreated substrate"
"at an elevated growth temperature" (Claim 1)	"at a growth temperature of 900 to 1100° C"
"prior to introducing a group V reactant or a group VI reactant" (Claims 1)	"prior to introducing any group V or group VI reactant"

The Court **ORDERS** each party not to refer, directly or indirectly, to its own or any other party's claim-construction positions in the presence of the jury. Likewise, the Court **ORDERS** the parties to refrain from mentioning any part of this opinion, other than the actual positions adopted by the Court, in the presence of the jury. Neither party may take a position before the jury that contradicts the Court's reasoning in this opinion. Any reference to claim construction proceedings is limited to informing the jury of the positions adopted by the Court.

Because this action has been stayed (Dkt. No. 154), any objections or appeal to the District

Judge need not be filed unless and until the stay has been lifted.

SIGNED this 4th day of November, 2024.

ROY S. PAYNE
UNITED STATES MAGISTRATE JUDGE